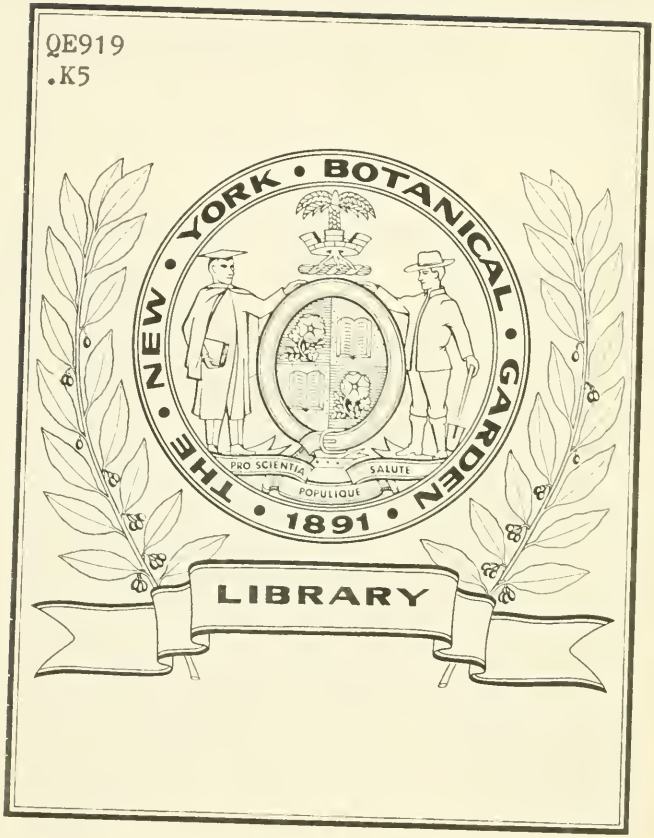
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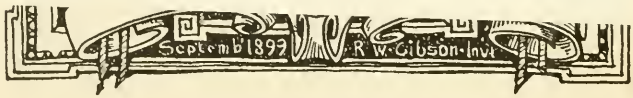
Septemb 1897 R W Gibson Invt

FLORA

FROM THE

APALACHIAN COAL-FIELD.

INAUGURAL DISSERTATION FOR THE DEGREE

OF

DOCTOR OF PHILOSOPHY,

ADDRESSED TO

THE PHILOSOPHICAL FACULTY

OF THE

University of Göttingen:

BY

JAMES P. KIMBALL
OF SALEM, MASS.

GÖTTINGEN:
PRINTED AT THE UNIVERSITY PRESS,
BY E. A. HUTH.
1857.

TO MY FATHER,

JAMES KIMBALL,

THESE FEW PAGES ARE INSCRIBED,

AS

A SLIGHT TRIBUTE OF FILIAL LOVE AND GRATITUDE.

PREFACE.

A number of fossil vegetable impressions, — from the Apalachian coal-field, — upon which the accompanying series of investigations was made, formed a part of a collection of Professor Ferdinand Römer, which, after his return from a scientific tour in North America, he deposited in the paleontological cabinet of the Berlin University.

Unfortunately, the notes pertaining to the immediate localities of these fossil impressions, are no longer to be found; but, with the exception of three species of Lepidodendra from the Ohio coal-field, it is certain that they are from the state of Pennsylvania. The matrix of the Ohio specimens is argillaceous sandstone, while that of the Pennsylvania fossils is of hard, bluish black, argillaceous slate.

The opportunity of investigating this interesting collection was kindly afforded me by Professor E. Beyrich of Berlin, to whom, — I hereby beg leave to express my sincere regard and gratitude.

J. P. K.

Göttingen, June 19, 1857.

CALAMITEAE.

CALAMITES APPROXIMATUS, BRONG.

Brong. Hist. végét. foss. I, *p.* 134, *pl.* 15, *figs.* 7, 8, — *pl.* 24.
Gutbier, (*Aug. von*) *Abdr. u. Verst. d. Zwick. Schw. Kohl. Gebir. etc. vol.* I, *p.* 23, *pl.* 2, *fig.* 3.
Lindl. and Hutt. Foss. Flo. etc. vol. 1, *pl.* 77; *vol.* 3, *p.* 216.
Sternb. Vers. I, *p.* 26; II, *p.* 47.
Schloth. Petref. p. 400, *pl.* 20, *fig.* 2.
Unger, *Gen. et Spec. p.* 48.
Artis, *Antedil. Phytol. pl.* 4.
Bunbury, *on the Coal Formation of Cape Breton: — Quar. Jour. of Geog. Soc. of Lond.* 1847, *p.* 433.

CALAMITES ORNATUS,

Sternb. Vers. I, *p.* 27; II, *p.* 49.

CALAMITES INTERRUPTUS,

Schloth. Petref. p. 400, *pl.* 20, *fig.* 2.

Our decorticated specimen, which is but a mere fragment, of this common species, agrees most perfectly with Bronguiart's first figure [1]. The internodes regularly and gradually diminish in length; the striae are fine, — yet distinct, and their terminations very perceptible.

Distribution, in coal formation: — at Jarrow Colliery, Wentworth, Newcastle and Kilkenny — in Great Britain; at Manebach, Essen, Saarbrück, Charlottenbrunn and Wettin — in Germany; at Alais and St. Etienne — in France; at Ekaterinaburg in Russia; at Cape Breton, and in Pennsylvania, — North America.

[1] Hist. végét. foss. pl. 24.

CALAMITES DECORATUS, BRONG.

Brong. Class. végét. foss. p. 17, *pl.* 1, *fig.* 2.
Brong. Hist. végét. foss. I, *p.* 123, *pl.* 14, *figs.* 1—5.
Unger, Gen. et Spec. p. 44.
Sternb. Vers. I, *p.* 27; II, *p.* 49.
Schloth. Petref. p. 401.
Artis, Anted. Phytol. pl. 24.

The inverted figure [1] of Brongniart seems a very accurate fac-simile of our fragmentary and decorticated specimen, which is most distinctly defined. The striae are crooked, and the tubercles at their extreme superior terminations, are remarkably tumid and nearly hemispherical.

Distribution, in coal formation: — at Lowmoor and Lea Brook — in England; at Mannebach and Saarbrück — in Germany; in Pennsylvania.

ASTEROPHYLLITAE.

ASTEROPHYLLITES RIGIDA, BRONG.

Brong. Prodr. ps. 154, 159, 176.
Unger, Gen. et Spec. p. 64.
Bronn and Roemer, Leth. Geog. vol. 1, *p.* 104, *pl.* 8, *fig.* 7.

SCHLOTHEMIA DUBIA,

Sternb. Vers. II, *p.* 32; *Lindl. and Hutt. Foss. flo. vol.* 2, *p.* 150, *pl.* 211.

BRUCKMANNIA RIGIDA,

Sternb. Vers. I, *p.* 29, *pl.* 19, *fig.* 1.

Stem articulate, — strongly, longitudinally striate; leaflets spike-shaped, acuminate, striate, rigid, directed upward and about three times the length of the internodes.

[1] As above, fig. 1.

Distribution, in coal formation: — at Minitz, Bohemia; at Jarrow Colliery, England; in Pennsylvania.

ASTEROPHYLLITES EQUISETIFORMIS. BRONG.

Brong. Prodr. p. 159.
Unger, Gen. et Spec. p. 64.
Germar, Petref. shat. lith. Wettin. etc. p. 17, *pl.* 8.

BORNIA EQUISETIFORMIS,

Sternb. Vers. I, *p.* 28, *pl.* 19.

CASUARINITES EQUISETIFORMIS,

Schloth. Flo. der Vorw. pl. 1, *fig.* 1; *pl.* 2. *fig.* 3; *Petref. p.* 397.

HIPPURITES EQUISETIFORMIS,

Lindl. and Hutt. Foss. Flo. vol. 2, *pl.* 191.

Stem articulate and finely striate; leaflets nearly linear, lanceolate, sharply pointed at the apex and so arranged that no constant angle with the stem is maintained: — they are, however, directed but slightly upward.

Our fossil impression agrees most perfectly with Schlotheim's figures of this species, and differs from Sternberg's representation in respect to the size of the stem, which in the former is about one sixth as large as in the latter. Sternberg's figure, — it may be presumed, — is that of a more fully developed plant.

Distribution, in coal formation: — at Mannebach and Wettin, — Germany; at Blackwood, England; in Pennsylvania.

NEUROPTERIDEAE.

NEUROPTERIS SCHEUCHZERI, HOFFM.
Pl. 1, fig. 1.

Hoffm. Karsten's Archiv. 13, *Th.* 2, *p.* 27 *in Keferst. Deutsch. geog. p.* 151, *figs.* 1—4.

Unger, *Gen. et Spec. p.* 74.
Sternb. Vers. II, *p.* 70.
Göpp. Syst. fil. foss. p. 192.

PHYLLITES MINERALIS,

Lluid. lithoph. Brit. ichnog. p. 12, *pl.* 5.

OSMUNDA,

Scheuchz. herb. diluv. p. 48, *pl.* 10, *fig.* 3.

Leaflet oblong, acute at the apex, sub-cordate at the base, — one half projecting beyond the other, — about two inches long and an inch wide; midrib very prominent and apparently not attenuate; veins remarkably delicate and dichotomous.

Our specimen consists of a single detached pinnule, and is most beautifully defined. The apex, however, is unfortunately wanting, but an impression in the matrix indicates its exact contour.

It will be observed that our specimen, which seems referable to no other known species, possesses a singular developement of the base, — hitherto undescribed, — an even margin and excessively fine venation.

Distribution, in coal formation: — at Osnabrück, Germany; in England; at Wilkesbarre, Pennsylvania.

NEUROPTERIS ~~ROGERSII,~~ KIMBALL.

Pl. 1, fig. 2.

This most remarkable fossil impression consists of a pinnately five-foliolate, fourlobed leaf, — sessile and cordate at the base. The leaflets are oblong-ovate; the sinuses are deep and of unequal length. The venation is very fine and furcated — distinctly dichotomous; the margin is very even. The midrib is moderately distinct, and, as it recedes from the base, be-

comes gradually attenuate, until near the apex it is scarcely perceptible.

Notwithstanding the absence of a foliolate leaf under the genus *Neuropteris*, as hitherto understood, we are led, disregarding the anomaly, to refer our specimen to it. Arguing from several striking coincidences between the two, this course seems to be far more expedient than to advance a new generic name, until we are confident that necessity demands such.

The developement of the base, — its cordate form and its sessile adherence; the venation; the midrib and the texture of the leaf — are all marked features of this fossil impression, — perfectly agreeing with eminent characteristics of *Neuropteris*.

We assume the honour of giving, as a specific name, to this singular fossil plant that of the two distinguished brothers, — Professors W. B. and H. D. Rogers, — which is so permanently and illustriously connected with American and cosmographic geology.

Locality, in coal formation, — Pennsylvania.

PECOPTERIDEAE.

ALETHOPTERIS SAUVEURII, GÖPP.

Pl. I, fig. 3.

Göpp. Syst. fil. foss. p. 311.
Unger, Gen. et Spec. p. 151.

PECOPTERIS NERVOSA,

King, — Edinburgh New Philos. Jour. vol. 36, *p.* 286, *pl.* 5, *fig.* 9.

PECOPTERIS NERVOSA,

Brong. Hist. végét. foss. I, *p.* 297, *pl.* 95, *figs.* 1, 2.

PECOPTERIS SAUVEUH,

Brong. Hist. végét. foss. I, *p.* 299, *pl.* 95, *fig.* 5.

Frond impari-pinnate; petiole moderately prominent and attenuate; leaflets nearly elliptical, decurrent and confluent; midrib indistinct; veins furcated, — some emanating from the midrib and others from the petiole.

Our specimen perfectly coincides with King's figure, and the points of disparity between the former and the representations of Brongniart, and of Lindley and Hutton also precisely correspond with those noticed by King [1].

Distribution, — in coal formation, at Felling Colliery, England; in Pennsylvania.

(?) ALETHOPTERIS MARGINATA, GÖPP.

Göpp. Syst. fil. foss. p. 301.
Unger, Gen. et Spec. p. 147.

PECOPTERIS MARGINATA,

Brong. Prodr. p. 57; *Hist. végét. foss.* 1, *p.* 291, *pl.* 87, *fig.* 2.

Frond pinnately parted, — the sinuses reaching nearly to the petiole, which is curvilinear and gradually attenuate; pinnulae dilate, confluent and decurrent at the base, — crenate and possessing a heavily marked margin, — approximatively lanceolate, and rounded at the apex; surface of the pinnulae strongly undulating; midrib very prominent; nerves distinctly dichotomous and arranged nearly at right angles to the midrib.

[1] "In figure 9, plate 5, I have represented a portion of the Felling *Pecopteris nervosa*, by which it will be seen that although the leaflets are confluent with each other at the rachis, and, therefore, so far in agreement with the genus in which it has been placed, — the absence of a distinct midrib (In Lindley and Hutton's figure of this species, the leaflets are represented with what might be considered a midrib; but the veining has not been properly attended to.) and several veins springing from the rachis, utterly forbid us placing it in *Pecopteris*" — etc. King, *ibid.*

The nerves of the leaflets of this species, are described by all the above mentioned authors as simple and nearly at right angles to the midrib; [1] — whereas these nerves of our fossil impression, which consists of two detached pinnae, are, as already observed, discovered to be dichotomous, while their direction agrees with that always attributed to the species.

It seems barely expedient to base the specific independence of this fossil plant upon this single disparity: — we choose, rather, to leave the case as it stands, — subject to future correction. The author feels himself justified, however, in expressing his opinion that the furcation of the nerves has hitherto escaped observation, — inasmuch as it was detected in the present case, only through the aid of quite a powerful lens; while the fossil impression is very distinctly defined.

Distribution, in coal formation: — at Alais (?), France; in Pennsylvania.

HEMITELITES TREVIRANI, GÖPP.

Pl. I, fig. 4.

Göpp. Syst. fil. foss. p. 233, *pl.* 38, *figs.* 3, 4.
Unger, Gen. et Spec. p. 161.

PECOPTERIS TREVIRANI,

Sternb. Vers. I, *p.* 158.

Frond bipinnate; petiole channeled, strong and not attenuate; leaflets long, sub-ovate, adjacent at the base and situate obliquely to the common petiole; midrib distinct and extending to the apex of the leaflet; nerves right angular to the midrib. The leaflets bear traces

[1] "Nervis secundariis tenuissimis e nervo medio angulo recto exeuntibus subsimplicibus."

probably of fructification, as exhibited by regular dot-like impressions alternating with the nerves [1].

We are unable to derive testimony from our specimen, in support of the observations of both Göppert and Unger, — tending to establish the furcation of the veins of the leaflets pertaining to this species. They appear in the present instance, not trichotomous, but perfectly simple. This evidence, — it must be confessed, — is, perhaps, of little value, inasmuch as our fossil impression seems somewhat obliterated.

Distribution, in coal formation: — at Waldenburg, Silesia; in Pennsylvania.

PECOPTERIS HAIBURENSIS, LINDL. & HUTT.

Lindl. and Hutt. Foss. Flo. vol. 3, *p.* 97, *pl.* 187.
Unger, Gen. et Spec. p. 179.

Frond bipinnate; petiole strongly defined, somewhat rigid and attenuate; pinnulae approximatively ovate, contiguous and decurrent; veins furcated. The pinna is impari-pinnate, and the leaflet at the apex is obtuse or rounded at its apex and lanceolate-ovate at its inferior part.

Distribution, in coal formation: — at Haiburn Wyke, England; in Pennsylvania.

[1] "Durch die dreigabligen im rechten Winkel von dem Mittelnerven ausgehenden Seitennerven mit ihrer doppelten Reihe von Fruchthäufchen durchgedrückt, was die Vergrösserung eines Fiederblättchens, Fig. 4, eben so schön als treu zeigt." — *Göpp. Syst. fil. foss. p.* 233.

STIGMARIEAE.

STIGMARIA FICOIDES, BRONG.

Brong. Mém. Mus. d' hist. des végét. foss. p. 82, 88, *pl.* 7; *Prodr. p.* 88.
Sternb. Vers. I, *p.* 38; II, *p.* 209, *pl.* 15, *figs.* 4, 5.
Unger, Gen. et Spec. p. 227.

VARIOLARIA FICOIDES,
Sternb. Vers. I, *p.* 24, *pl.* 12, *figs.* 1, 2, 3.

Our specimen exhibits many of the permanent features of this common species, [1] to which alone it seems referable, and is individually characterized by a remarkable uniformity in the arrangement of its tubercles, which possess a very distinct diametrical marking instead of the central dot-like impression, — usually attributable to the species. The surface has a very slight, but still quite perceptible furrowed developement.

This specimen seems, indeed, to bear testimony to the truth of Bunbury's observation, that "The variations observable in different specimens of this common Stigmaria are very numerous; — yet slight and scarcely admitting of precise definition." [2]

This species bears much analogy to the *Stigmaria anabathra* of Corda, [3] with which it is often confoun-

[1] "St. trunco decumbente, ramis alternis teretiusculis primum laevibus dein plicatis v. rugulosis, foliis teretibus longis, fasciculis vasorum cuneiformibus, vasis amplis porosis." — *Unger, ibid.*

[2] The Quarterly Journal of the Geological Society of London, — 1847: — C. J. F. Bunbury on the Coal Formation of Cape Breton.

[3] *Corda, Beiträge, p.* 34, *pl.* 14; *Unger, Gen. et Spec. p.* 227.
STIGMARIA FICOIDES,
Lindl. and Hutt. Foss. Flo. vol. 1, *p.* 94, *pl.* 31 *to* 36: — *vol.* 2,

ded. It is, indeed, often barely possible to distinguish a fragment of the one from that of the other.

Distribution, in coal formation: — at Radnitz and Swinham, Bohemia; in Sydney coal-field, Cape Breton; at Frostburg, Maryland; [1] in Pennsylvania.

SIGILLARIEAE.

SIGILLARIA ARZINENSIS, CORDA.

Pl. I, fig. 5.

Corda, Beiträge, p. 29, *pl.* 59, *fig.* 12.
Unger, Gen. et Spec. p. 247.

Trunk longitudinally and strongly furrowed; flutings straight and parallel; surface slightly punctate; cicatrices elliptical, — situate remote and equidistant from the edges of the flutings; vascular bundles situate between the centre and one focus of the ellipse, and denoted by two crescent shaped markings placed diametrically opposite, and, in the centre of the inclosed space, by a dot-like marking.

The specimen, of a segment of which we give a representation, is, where deprived of its cortical integument, quite destitute of even the semblance of scars or bundles of vessels. It differs from Corda's figure of an impression from the coal mine of Arzin, Bohemia, only in respect to the longitudinal distance between the scars,

p. 13: — *vol.* 3, *p.* 47, *pl.* 166; *Göpp. Syst. fil. foss. p.* 92, *pl.* 23, *fig.* 7: — *Gat. foss. Pfl. p.* 13, *pl.* 8—15; *Brong. Archiv. du Mus. d' hist. etc. tom.* 1, 1839, *pl.* 29.

[1] Quart. Jour. Geol. Soc. II, p. 427: — Fossil Ferns from Frostburg. Maryland, — collected by Sir C. Lyell: by C. J. F. Bunbury.

which, in the former, is about a third greater than in the latter.

Locality, in coal formation, — Pennsylvania.

SIGILLARIA RUGOSA, BRONG.
Pl. II, fig. 1.

Brong. Hist. végét. foss. I, *p.* 446, *pl.* 144, *fig.* 2; *Prodr. p.* 64. *Unger, Gen. et Spec. p.* 249.

Trunk longitudinally and prominently furrowed; flutings parallel and commensurate.

Denuded of its cortical integument our specimen exhibits the following characteristics: — surface slightly punctate; cicatrices discoid-ovate, situate, longitudinally, remote from each other, — laterally, in the middle of the fluting and leaving on either side a margin equal to their own breadth; vascular bundles denoted by two opposite, nearly crescent shaped markings, — between which is a third dot-like impression; longitudinally intervening the scars is a prominent marking, gradually expanding in breadth as, from the middle, it approaches the scars.

Invested with its bark-like exterior: — surface longitudinally, delicately striate; position of cicatrice denoted by a distinct knot-like marking; longitudinal developement between the scars not appearing.

Between Brongniart's figures of this species and our fossil impression, there exist two slight disparities: — firstly, in respect to the form of the cicatrice, which, according to Brongniart, assumes less of a discoid-ovate contour than is observable in the present instance; and, secondly, in respect to the form of the so-called rugosity, which Brongniart has represented as nearly uni-

form, — approximating, if anything, to attenuation in its approach to the scars; — while our specimen exhibits this rugosity as remarkably expanded in width in the proximity of the scars.

Besides the perfect agreement, in all other respects, between Brongniart's figure and our impression, the coincidence of locality is certainly worthy of consideration, — the fossil prototype of his plate being from Wilkesbarre, Pennsylvania: while ours, if not, with certainty, attributable to the same mine, may safely be attributed to the same local and geological formation.

Locality, in coal formation: — at Wilkesbarre, Pennsylvania.

SIGILLARIA ELLIPTICA, BRONG.

Brong. Prodr. p. 65; *Hist. végét. foss.* I, *p.* 447, *pl.* 152, *figs.* 1—3; *pl.* 163, *fig.* 4.

Unger, Gen. et Spec. p. 237.

Trunk longitudinally and strongly furrowed; flutings proportionately narrow, straight, parallel and equal; cicatrices depressed, (or elevated, according to the impression,) approximatively discoid-ovate, [1] (appearing as if flattened in the smaller part of the periphery, and laterally extended in the larger part, so as to render the transverse axis nearly equal to the conjugate axis, — besides giving the scar somewhat of a resemblance

[1] "Cortice laevi, cicatricibus discoideis valde approximatis elliptico-sub-hexagonis, angulis obtusis rotundatis, inferioribus magnis expressis, in carinas duas divergentes decurrentibus, sulco transversali costarum valde impresso." *Brong. Hist. végét. foss. ibid.*

to a hexagon,) situate, longitudinally, one half their length, or less, apart from each other, [1] and, transversely, extending almost to the edges of the fluting; vascular bundles small, — situate nearly in the middle of the scar, and consisting, as usual, of the two opposite crescent-shaped markings, which enclose the third dot-like impression. Immediately adjoining the upper or smaller end of the cicatrice is a distinct, superior, curvilinear marking, extending entirely across the fluting.

This species possesses many features in common both with *Sigillaria Boblai, Brong.* and *Sigillaria Saulii, Brong.* The former of these is chiefly characterized in distinction from it, in the perfect hexagonal developement of its scars, and in the relative irregularity of its flutings; while the latter is invested with a peculiar bark-like integument. It bears also some resemblance to *Sigillaria notata, Brong.* which is, however, quite devoid of distinct furrows, and is still farther distinguishable in the remarkable angularity of the lateral angles of its scars [2].

It should be remarked, that of Brongniart's four figures of as many individual specimens of this species, figures 1 and 2, plate 152, l. c. — agree more particularly with our fossil impression. The position, which is given to the bundles of vessels, is scarcely as near the middle of the scar as our specimen indicates.

Distribution, in coal formation: — at Fresnes and Vieux Condé, France; at Stangalpe, Styria; in Pennsylvania.

[1] Brongniart's representation — pl. 163, fig. 4, l. c. — of a fossil impression referable, as a variety, to the same species, shows the longitudinal distance between two scars to be about one and a half times the length of a scar.

[2] *vid.* Brong. Hist. végét. foss. I, p. 448.

SIGILLARIA ELEGANS, BRONG.
Pl. II, fig. 2.

Brong. Hist. végét. foss. I, *p.* 438, *pl.* 146, *fig.* 1; *pl.* 155; *pl.* 158, *fig.* 1.

Unger, Gen. et Spec. p. 235.

Corda, Beiträge, p. 24, *pls.* 7, 8, 9.

F. Roemer, Leth. Geog. pl. 7, *fig.* 6; *vol.* I, *p.* 134.

Trunks

SIGILLARIA HEXAGONA,
Brong. Prodr. p. 65; *Hist. végét. foss. pl.* 155.

FAVULARIA HEXAGONA,
Sternb. Vers. I, *p.* 13.

PALMACITES HEXAGONUS,
Schloth. Petref. p. 394, *pl.* 15, *fig.* 1.

Ramifications

SIGILLARIA ELEGANS,
Brong. Prodr. p. 65.

ASPIDARIA VARIOLATA,
Sternb. Vers. II, *p.* 181, *pl.* 68, *fig.* 12.

FAVULARIA VARIOLATA,
Sternb. Vers. I, *p.* 13.

FAVULARIA ELEGANS,
Sternb. Vers. I, *p.* 14, *pl.* 52, *fig.* 4.

PALMACITES VARIOLATUS,
Schloth. Petref. p. 395, *pl.* 15, *fig.* 3.

Trunk longitudinally and delicately furrowed; furrows somewhat uneven or crenate, approximatively parallel and equal; cicatrices discoid-subhexagonal, wider than long, contiguous, — separated, transversely, by slightly curvilinear furrows, extending entirely across the fluting — vertically, by the longitudinal furrows, which also assume a slightly curvilinear direction opposite the scars: thereby

causing their crenation; vascular bundles denoted by three transversely opposite markings, — the two crescent shaped extremes enclosing the third horizontal linear impression, — situate near the superior or smaller edge of the cicatrice.

The following are additional important features of this species in general.

Trunk dichotomous; cicatrices twice as large upon the trunk as upon the ramifications, and, upon the latter, more curvilinear in their superior or smaller edges than upon the former.

Distribution, in coal formation: — at Radnitz, Bohemia; at Werden near Düsseldorf; at Eschweiler near Aix-la-Chapelle; at Bochum and Hattingen, Westphalia; at Stangalpe, Styria; at Horton and Windsor, Nova Scotia; at Sydney, Cape Breton; in Pennsylvania.

SIGILLARIA ICHTHYOLEPIS, CORDA.

Pl. II, fig. 2.

Corda, *Beiträge*, *p.* 29, *pl.* 9, *fig.* 19.
Unger, *Gen. et Spec. p.* 231.

FAVULARIA ICHTHYOLEPIS,
Sternb. Vers. II, *pl.* 38, *fig.* 2 *b*, (2 *a* ?)

Denuded of its cortical exterior, our specimen is characterized as follows: — trunk completely covered with delicately marked, contiguous and commensurate cicatrices, which have a longitudinal and regular columnar arrangement; cicatrices hexagonal and about twice as wide as long, — their opposite sides and angles are equal, their two lateral angles acute and their remaining four obtuse, while the four sides, forming the two lateral

angles are furnished with a narrow lining, or margin-like marking; vascular bundles situate nearly in the centre of the cicatrice, and denoted by three crescent-shaped markings, two of which are exceedingly small and vertically placed, while the third is comparatively large, and laterally placed between the other two.

Invested with its bark-like integument, the trunk shows no trace of cicatrices; but the position of the vascular bundles is denoted by a strongly tumid tubercle, which imparts to the fossil impression, in this condition, the appearance of a Stigmaria. The cortex, itself, is very thin, notwithstanding the prominence of the tubercle. The prototypes of Corda's and Sternberg's figures were evidently deprived of this integument, which, we believe, has hitherto remained undescribed.

Our specimen, it should be observed, which is most distinctly and beautifully impressed, indicates the lining-like marking on each of the four lateral sides of the cicatrice; — whereas both Sternberg and Corda have represented one of these sides [1] as destitute of this marking.

Although this disparity may, perhaps, be a matter of little importance, it may be easily accounted for from the fact that the scars of this species, are so delicately marked, that the slightest indistinctness of a fossil impression, would obviously lead to the conviction of both of these distinguished naturalists: — indeed, in the present instance, careful observation is requisite in order to trace this marginal developement.

Sternberg's second figure [2] of a fossil impression, referred to this species, agrees most perfectly with Brongn-

[1] *vid. c, fig.*

[2] Sternb. Vers. II, pl. 38, fig. 2a.

iart's representation of *Sigillaria Menardi, Brong.* [1] from Wilkesbarre, Pennsylvania. If the identity of Sternberg's figures be admitted, the identity of these two modifications of Sigillaria can scarcely be denied.

Distribution, in coal formation: — at Radnitz, Bohemia; in Pennsylvania.

SYRINGODENDRON PES CAPREOLI, STERNB.
Pl. II, fig. 3.

Sternb. Vers. I, *p.* 24, *pl.* 13, *fig.* 2.
Unger, Gen. et Spec. p. 251.

SYRINGODENDRON STRIATUM,
Brong. Class. végét. foss. p. 20, *pl.* 1, *fig.* 3.

Trunk longitudinally, parallelly and regularly furrowed; channels and ribs commensurate; cicatrices of a knot-like appearance and nearly linear form, — twice as long as wide, — situate, vertically, in the middle of the rib and about ten lines remote from each other.

Our fossil impression is invested with a thick, brittle integument of lustrous bitumen, or mineral coal; and the cicatrices, unlike Sternberg's figure of this species, appear where the specimen is denuded of this exterior.

Distribution, in coal formation: — at Radnitz, Bohemia; in Pennsylvania.

SYRINGODENDRON CYCLOSTIGMA, BRONG.
Pl. III, fig. 1.

Brong. Hist. végét. foss. I, *p.* 480, *pl.* 166, *figs.* 2, 3.
Unger, Gen. et Spec. p. 251.

Trunk longitudinally, slightly and regularly furrowed; surface delicately, vertically striate; cicatrices circular,

[1] Brong. Hist. végét. foss. I, p. 430, pl. 158, fig. 5.

somewhat tumid, small, — and exhibiting a dot-like central mark, — situate in the middle of the fluting, and about five lines remote from each other.

Longitudinally intervening the scars is a prominent, connecting developement, or rugosity, which assumes more or less of an attenuate, convergent form, as from its middle it approaches the cicatrices. Both integument and interior surface are characterized alike.

Distribution, in coal formation: — at Anzin, Valentia; in Pennsylvania.

LEPIDODENDREAE.

LEPIDODENDRON LINDLEYANUM, UNG.

Unger, Gen. et Spec. p. 256.

LEPIDODENDRON OBOVATUM,
Lindl. and Hutt. Foss. Flo. vol, I, *pl.* 19 *bis. p.* 63.

LEPIDODENDRON OBOVATUM,
Hugh Miller: — The Testimony of the Rocks, etc. Edinburgh, 1857, *p.* 38, *fig.* 33.

SAGENARIA LINDLEYANA,
Sternb. Vers. II, *p.* 179.

Areolae obovate-elliptical; apex wide and rounded; base attenuate or tapering; central ridge strongly marked, straight or slightly curvilinear, and undivided; scar at the very apex of the areola rhomboidal.

This scar, last mentioned, is often characterized as approximatively circular in its outline, and is, indeed, more or less so represented by most of the authorities

given above. We are not confident that the form of this cicatrice is a constant feature of the species; but our specimen certainly leads us to support the conviction of Unger, who describes this cicatrice as *rhombea laevi.*

Distribution, in coal formation: — at Radnitz, Bohemia; at Waldenburg, Silesia; at Jarrow Colliery, England; in Ohio.

LEPIDODENDRON DICHOTOMUM, STERNB.

Pl. III, fig. 2.

Sternb. Vers. II, *p.* 177, *pl.* 68, *fig.* 1.
Unger, Gen. et Spec. p. 253.
Roemer, Leth. Geog. vol. 1, *pl.* 8, *fig.* 2.

LYCOPODITES DICHOTOMUS,
Sternb. Vers. I, *ps.* 9, 19, 23, *pls.* 1, 2, 14, *fig.* 1.

LEPIDODENDRON STERNBERGII,
Brong. Prodr. p. 85; *Lindl. and Hutt. Foss. Flo. vol.* 2, *pl.* 112, *p.* 83.

Areolae rhomboidal; angles sharply defined; superior and inferior angles acute; cicatrice at the very apex of the areola quadrilateral, — the superior angle of the areola forming the superior angle of the cicatrice, and two slightly curvilinear sides forming the angle whence proceeds the central ridge, which is strongly marked, but not traceable to the inferior angle of the areola.

The figures of this species furnished by Lindley and Hutton, differ from those of both Graf Sternberg and Adolphe Brongniart, and also from our specimen, in respect to the form of the scar, situated at the very apex of the areola, which, in the figures alluded to, [1] assumes

[1] Lindl. & Hutt. Foss. Flo. vol. 2, p. 83, pl. 112.

nearly a crescent shape, having no inferior angle, — but, instead, one continuous, strongly curvilinear boundary.

Distribution, in coal formation: — at Swina, Bohemia; in Ohio.

LEPIDODENDRON ELEGANS, BRONG.

Pl. III, fig. 3.

Brong. Hist. végét. foss. II, *pl.* 14.
Unger, Gen. et Spec. p. 255.

LEPIDODENDRON GRACILE,
Brong. Hist. végét. foss. II, *pl.* 15.

Areolae very strongly marked, approximatively hexagonal, — the perimeter being, however, more or less curvilinear; superior and inferior angles acute; cicatrice rhomboidal, and situate about a third of the vertical length of the areola remote from the superior angle; central ridge prominent, and extending in a straight line from the superior to the inferior angle; markings, proceeding from the lateral angles of the rhomboidal cicatrice, prominent, curvilinear and extending to the inferior boundary of the areola.

Brongniart's figures of this species perfectly agree with our specimen, and most obviously differ from Sternberg's *Lepidodendron obovatum*, [1] with which it is often supposed to be identical, and Unger places it as synonymous, — giving it, to be sure, the benefit of a note of interrogation.

This undeniable disparity is apparently not sufficiently

[1] Sternb. Vers. I, p. 10, pl. 6, fig. 1, pl. 8, fig. 1; Unger, Gen. et Spec. p. 255. etc.

unimportant to invalidate Brongniart's classification, or to demonstrate why the fossil plant should be denied the dignity of a peculiar and independent species. The manifest objection to the specific independence of every modification of the *Lepidondendra* seems scarcely applicable in the present instance; — for our specimen is remarkably large, and, it may be presumed, fully developed, while the areolae are most distinctly defined.

Distribution, in coal formation: — in Sydney coal field, Cape Breton; [1] at South Joggins, Nova Scotia; in the coal field of Tuscaloasa, Alabama; [2] in Ohio — immediately in argillaceous sandstone [3].

LEPIDODENDRON BEYRICHII, KIMBALL.
Pl. III, fig. 4.

Areolae perfectly contiguous, — approximatively hexagonal (the perimeter being, however, decidedly curvilinear); surface delicately, longitudinally striate; scar circular and situate in the middle of the areola; subjacent to the central scar is a distinct, but irregularly shaped marking.

Of all the hitherto described *Lepidodendra*, we find but two species that possess any remarkable features

[1] The Quar. Jour of the Geol. Soc. of London, 1847: — C. J. F. Bunbury: — on the coal formation of Cape Breton.

[2] Sill. Jour. 2nd se. 2—1846, p. 228: — Observations on the Fossil Plants of the coal field of Tuscaloasa, Alabama, — by C. Lyell with a description of some species by C. J. F. Bunbury.

[3] This matrix of argillaceous sandstone is characterized by a high degree of friability, and by its richness in minute grains or scales of mica. The Ohio specimen of *Lepidodendron dichotomum*, page25, lies in the same rock.

in common with our specimen, — namely — the *Lepidodendron Steinbeckianum* of Göppert, [1] and the *Lepidodendron undulatum*, or *Aspidaria undulata*, of Sternberg [2]. It resembles the former only in contour, and differs from it — firstly — in the absence of a central, curvilinear ridge, extending from the superior to the inferior edge of the areola; and — secondly — in respect to the size of the areolae, which is about four or five times larger than that of Göppert's species.

The two figures of Sternberg, it must be confessed, are exceedingly dissimilar, notwithstanding the well supported supposition of the specific identity of their prototypes. Our specimen coincides with both only in respect to the form and situation of the central scar, while the points of difference are important and numerous. A rhomboidal form of the areolae, and a marginal developement between them characterize the so-called *Aspidaria undulata* in distinction from our species, while the *Lepidodendron undulatum* differs from the same in the convexity of its areolae, and in the presence of a central ridge.

Taking advantage of his privilege, the author has named this species after his distinguished teacher and friend, Professor Beyrich of Berlin.

Locality, in coal formation, — Pennsylvania.

[1] Göpp. Syst. fil. foss. p. 466, pl. 41, figs. 4,5; Unger, Gen. et Spec. p. 258.

[2] Sternb. Vers. I, ps. 11, 21, pl. 10, fig. 2; II, p. 182, pl. 68, fig. 13; Unger, Gen. et Spec. p. 259; Brong. Prodr. p. 86.

THE END.

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1, *Neuropteris Scheuchzeri*, *Hoffm.*
2, *Neuropteris Rogersii*, *Kimball.*
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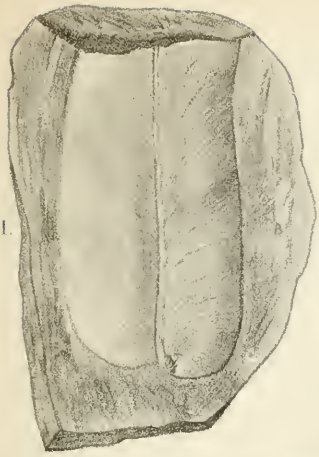
3a, do (magnified leaflet.)
4, *Hemitelites Trevirani*, *Göpp.*
5, *Sigillaria arzinensis*, *Corda.*

PLATE II.

1, *Sigillaria rugosa*, *Brong.*
2, *Sigillaria ichthyolepis*, *Corda.*
3, *Syringodendron pes capreoli*, *Sternb.*

PLATE III.

1, *Syringodendron cyclostigma*, *Brong.*
2, *Lepidodendron dichotomum*, *Sternb.*
3, *Lepidodendron elegans*, *Brong.*
4, *Lepidodendron Beyrichii*, *Kimball.*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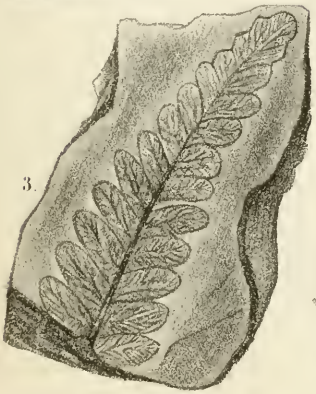
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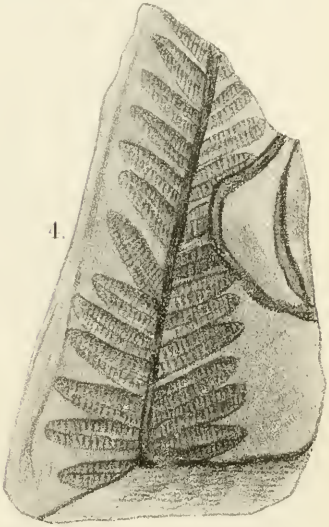
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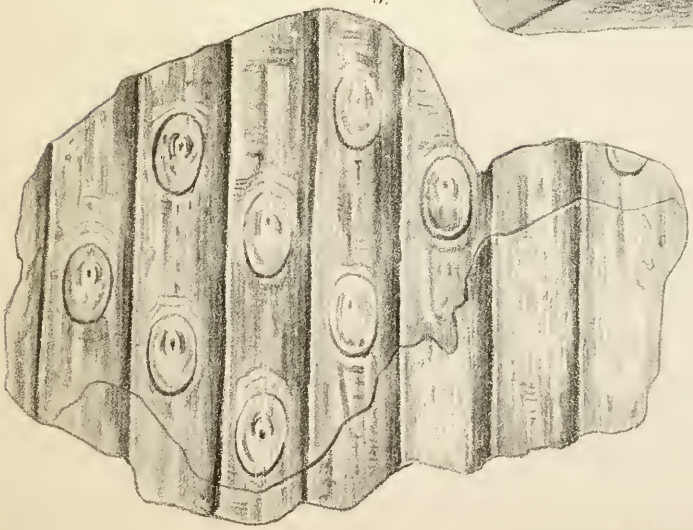
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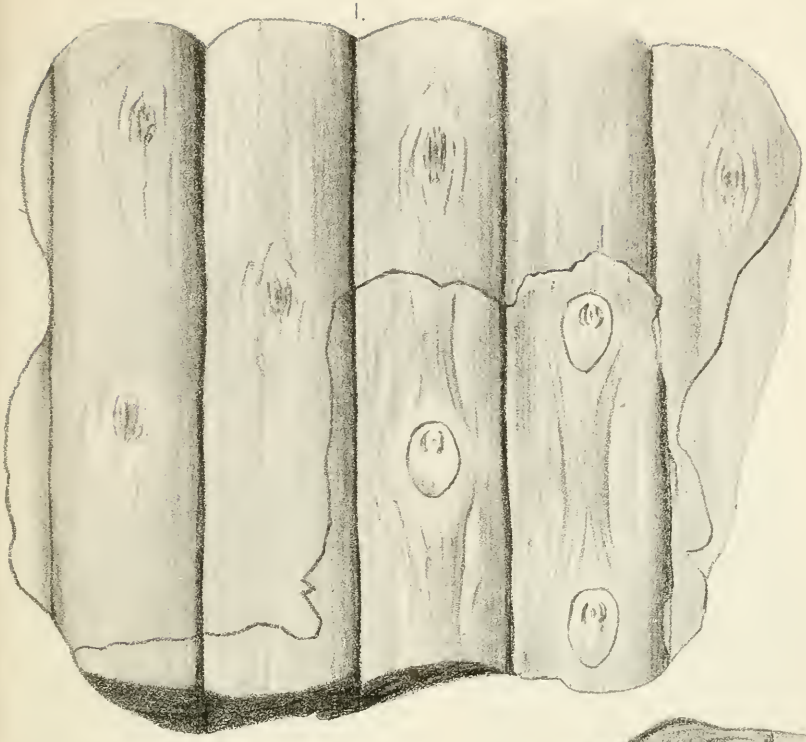

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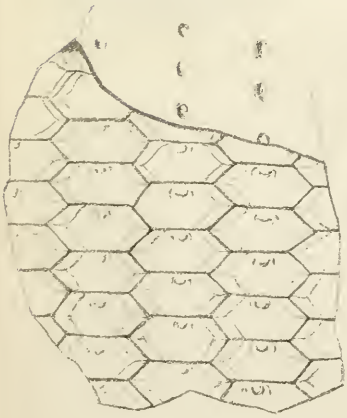

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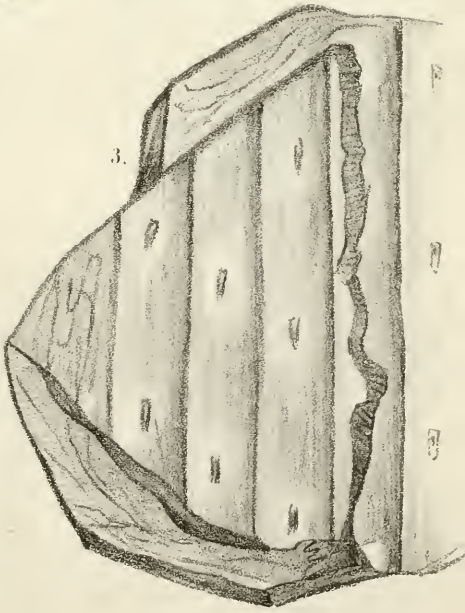

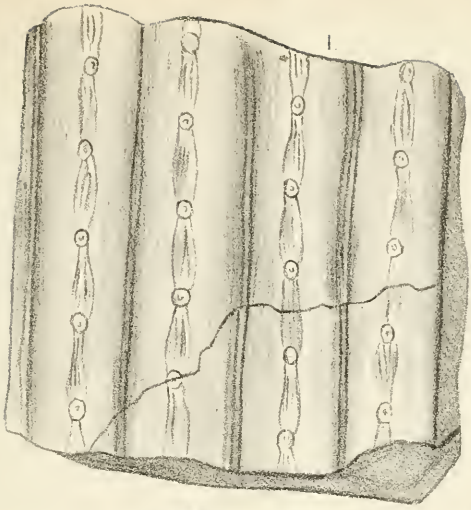
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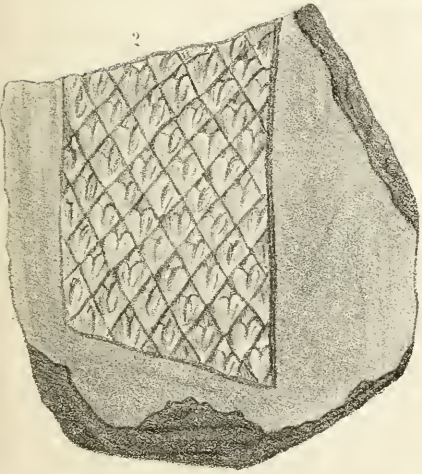
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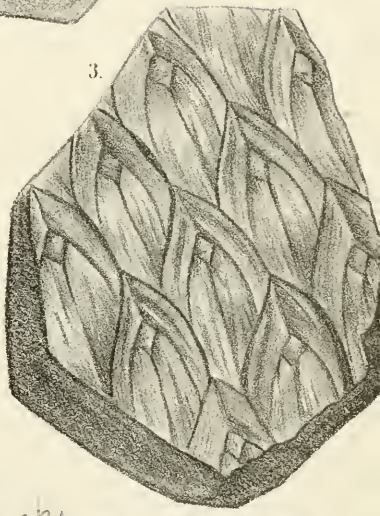
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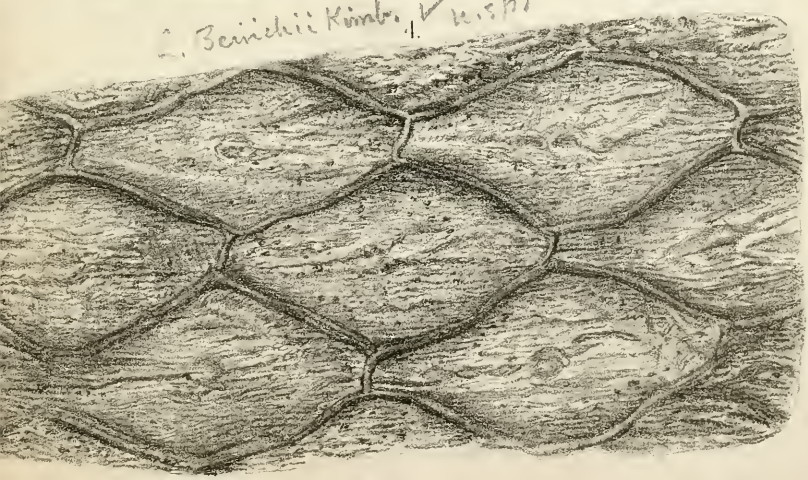
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